

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims

1. (Currently amended) A surveying instrument for measuring ~~the distance to a target to be measured~~, [[a]] horizontal angle, and [[a]] vertical angle by use of reflected light, wherein comprising:

~~an imager for obtaining a digital image which is associated with both the horizontal angle and the vertical angle is connectable to the surveying instrument~~ a plane part; and said surveying instrument comprises

~~an arithmetic processing means for determining~~ calculating a three-dimensional position of [[a]] said plane part by

~~determining from at least three measuring points an equation that includes the said plane part as the target to be measured; by measuring distance, horizontal angle, and vertical angle to each of at least three points substantially forming a triangle on said plane part;~~

~~and then by associating digital image data to which the said plane part belongs with the said equation so that the said plane part can be identified;~~

~~extracting edges of at least two intersecting straight lines forming said plane part; determining said straight lines based on image data related to said edges by the least-squares method or the conditional least-squares method; and~~

~~calculating an intersection point of said straight lines to determine said three-dimensional position of said plane part.~~

2. (Canceled)

3. (Previously presented) A surveying instrument according to claim 1, wherein: if at least two plane parts successively intersect with each other, edges of three straight lines forming the angle are extracted, and on the basis of image data of the edges, the straight lines are determined by the least-squares method or the conditional least-squares method, and then the angle which is an intersection point of the straight lines is calculated to determine a three-dimensional position of the plane part.

4. (Previously presented) A surveying instrument according to claim 1, wherein: if the plane part includes a straight line, a position and the length of the straight line are calculated by specifying the straight line.

5. (Previously presented) A surveying instrument according to claim 1, wherein: if the plane part has a window bordered by straight lines, the window is specified to identify the window to calculate a position and a shape of the window.

6. (Previously presented) A surveying instrument according to claim 1, wherein: if there is a point located on the plane part which is the target to be measured, a center-of-gravity position of image data of the point is determined, and then the center-of-gravity position is associated with the three measuring points to determine the three-dimensional position.

7. (Previously presented) A surveying instrument according to claim 1, wherein: if said surveying instrument faces the target to be measured, an equation which includes the plane part as the target to be measured is determined from a measured value of one point, and then digital image data to which the plane part belongs is associated with the equation so that the plane part can be identified, and thereby its three-dimensional position is calculated.

8. (Previously presented) A surveying instrument according to claim 4 or 5, wherein: a straight line or a window, which is included in a plane part, is specified by the collimation of a telescope included in the surveying instrument.

9. (Previously presented) A surveying instrument according to claim 4 or 5, wherein: a straight line or a window, which is included in the plane part, is specified by pointing an image displayed on a display unit included in the surveying instrument.

10. (Previously presented) A surveying instrument according to claim 1, wherein: the edges are extracted by use of a spatial filter such as Laplacian.

11. (Currently amended) A three-dimensional measurement method used in a surveying instrument for measuring the distance to a target to be measured, a horizontal angle, and a vertical angle by use of reflected light, said surveying instrument being configured so that an imager for obtaining a digital image in a measurement direction is connectable to the surveying instrument, said three-dimensional measurement method comprising:

~~a first step for~~ determining at least three measuring points of a plane part, and then for measuring the measuring points;

~~a second step for~~ determining an equation, which includes the plane part, from data of the distance and the angles of the three measuring points obtained by the measurements; and

~~a third step for~~ associating the digital image data to which the plane part belongs with the equation,

extracting edges of at least two intersecting straight lines forming said plane part;
determining said straight lines based on image data related to said edges by the least-squares method or the conditional least-squares method; and

calculating an intersection point of said straight lines to determine said three-dimensional position of said plane part;

wherein: a three-dimensional position of the plane part is determined from the image data that identifies the plane part and from the equation which includes the plane part.

12. (Currently amended) An electronic storage medium such as a FD, a CD, a DVD, a RAM, a ROM, or a memory card, wherein: said electronic storage medium is used when performing three-dimensional measurement by use of data obtained from a surveying instrument and an imager, which measure the distance to a target to be measured, a horizontal angle and a vertical angle using reflected light; and said electronic storage medium stores a program describing operation steps for determining a three-dimensional position of a plane part by

determining from at least three measuring points an equation which includes the plane part as the target to be measured, ~~and then by~~

associating digital image data to which the plane part belongs with the equation so that the plane part is identified,

extracting edges of at least two intersecting straight lines forming said plane part,
determining said straight lines based on image data related to said edges by the least-squares method or the conditional least-squares method, and

calculating an intersection point of said straight lines to determine said three-dimensional position of said plane part;

said operation steps being executed by an arithmetic processing means.

13. (Currently amended) An electronic storage medium according to claim 10 12, wherein: edges of at least two intersecting straight lines forming a plane part are extracted, and on the basis of image data of the edges, the straight lines are determined by the least-squares

method or the conditional least-squares method, and then an intersection point of the straight lines is calculated to determine a three-dimensional position of the plane part.

14. (Currently amended) An electronic storage medium according to claim ~~40~~ 12, wherein: if at least two plane parts successively intersect with each other, edges of three straight lines forming the angle are extracted, and on the basis of image data of the edges, the straight lines are determined by the least-squares method or the conditional least-squares method, and then the angle which is an intersection point of the straight lines is calculated to determine a three-dimensional position of the plane part.